



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION IX  
75 Hawthorne Street, WTR-3-1  
San Francisco, CA 94105

MEMORANDUM

SUBJECT: Arsenic health risks in drinking water

FROM: Bruce A. Macler, PhD  
Water Division Toxicologist  
USEPA Region 9

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**Where does arsenic in drinking water come from at Hopi?**

Arsenic in drinking water is almost always from natural sources in the ground. Rarely, groundwater can be contaminated from forms of arsenic used by humans (such as some wood preservatives) or from mining and smelter wastes.

**What level of arsenic is safe for drinking water?**

USEPA sets drinking water standards at levels we believe to be with little or no adverse health risk to those drinking that water over a lifetime, with an adequate margin of safety. Our goal is that waterborne disease should not be a concern for individuals or their communities. The USEPA drinking water maximum contaminant level (MCL) for arsenic is 0.010 mg/liter. The MCL is designed to protect a more-susceptible individual that drinks two liters of this water every day for their entire life. Drinking water with arsenic somewhat above the MCL for shorter amounts of time will be of similarly low health risk. However, safety of anything or any activity is in the eye of the beholder, so only you can make your own personal decision on this.

**What are the health risks from drinking water with elevated levels of arsenic?**

If you ingest or breathe enough of it, arsenic is definitely a poison, and has several adverse physiological effects. At high enough doses (about 100-200 milligrams (mg, 1/1000<sup>th</sup> of a gram)), it stops mitochondrial respiration, your cells can't generate energy, and they (and you) die. This is what is meant by acute toxicity. In addition, arsenic can cause oxidative damage and stimulates the formation of a variety of physiological stress-related proteins that can make other health problems you might have worse.

Arsenic has other direct effects on your body, too. A variety of skin diseases (hyperkeratoses, blackfoot, hyperpigmentation) are known to occur at levels starting around 0.1-0.2 mg per day. Long-term exposure (years) to lower levels of arsenic can lead to several adverse health outcomes. Some of these include Ischemic heart disease and cardiovascular disease (stroke, heart attack). Adverse pregnancy outcomes, immune system effects, neurocognitive effects (decreased IQ) and respiratory disease are known to occur from low, chronic exposures to arsenic. Arsenic also has hormonal effects that can cause diseases such as

diabetes. Recent studies suggest that, for some people, these may occur after long-term arsenic exposures near the MCL.

Arsenic is also a known human carcinogen. It appears to cause broken and missing chromosomes and other chromosomal abnormalities. It is known to cause lung, bladder, and skin cancers, and likely causes liver, kidney, pancreatic and prostate cancers. Elevated cancer levels are seen in groups of people drinking water with arsenic levels of 0.1-0.2 mg per liter, which is about 0.2-0.4 mg per day depending on how much water you drink. It usually takes many years of drinking water at these levels for cancers to occur. At higher levels (0.5-1.0 mg per day), these cancers can form faster. Current estimates are that your risk of getting some type of cancer is about 1/1000 from drinking water with 0.010 mg/liter arsenic (the current MCL) over your lifetime.

USEPA is reevaluating the risks from environmental arsenic exposures. The results to date suggest that arsenic is much worse for you than we previously thought.

### **Can I bathe or brush teeth with drinking water containing arsenic?**

Unlike drinking water with arsenic, you can bathe, shower or swim in water with arsenic with very low risk, because arsenic does not readily pass through the skin into your body. Also, under normal conditions, the amount of arsenic you would get from brushing your teeth would be minimal.

### **Can I wash vegetables or cook with water containing arsenic?**

The small amounts of arsenic from washing or cooking vegetables would not pose a significant risk. However, cooking rice, pasta, beans, lentils or other food items that absorb water will add to your ingestion of arsenic and to your risks.

### **Should I drink bottled water until there is a long-term solution?**

That is up to you. The water would need to meet drinking water standards.

### **Additional information**

The US Agency for Toxic Substances and Disease Registry has information on arsenic and other contaminants on its website ([www.atsdr.cdc.gov/ToxProfiles](http://www.atsdr.cdc.gov/ToxProfiles))